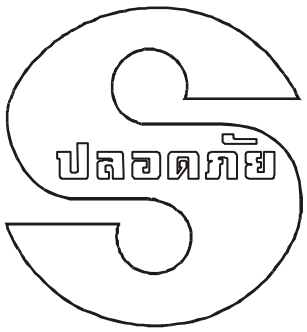

มาตรฐานผลิตภัณฑ์อุตสาหกรรม

THAI INDUSTRIAL STANDARD

มอก. 2204 – 2547

IEC 60728 – 11(1997 – 08)

(Amendment 1(2000 – 10))

ระบบกระจายสัญญาณโทรทัศน์และเสียงด้วยเคเบิล

เล่ม 11 ความปลอดภัย

CABLED DISTRIBUTION SYSTEMS FOR TELEVISION AND SOUND SIGNALS–

PART 11 : SAFETY

สำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม

กระทรวงอุตสาหกรรม

ICS 33.060.40

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มาตรฐานผลิตภัณฑ์อุตสาหกรรม

ระบบกระจายสัญญาณโทรทัศน์และเสียงด้วยเคเบิล

เล่ม 11 ความปลอดภัย

มอก. 2204 – 2547

สำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม
กระทรวงอุตสาหกรรม ถนนพระรามที่ 6 กรุงเทพฯ 10400
โทรศัพท์ 0–2202–3300

ประกาศในราชกิจจานุเบกษา ฉบับประกาศและงานทั่วไป เล่ม 122 ตอนที่ 56ง
วันที่ 14 กรกฎาคม พุทธศักราช 2548

ระบบกระจายสัญญาณโทรทัศน์และเสียงเป็นผลิตภัณฑ์ที่มีการใช้กันอย่างแพร่หลาย ปัจจุบันโรงงานในประเทศสามารถผลิตระบบกระจายสัญญาณโทรทัศน์และเสียงได้ เพื่อเป็นการส่งเสริมอุตสาหกรรมจึงกำหนดมาตรฐานผลิตภัณฑ์อุตสาหกรรม ระบบกระจายสัญญาณโทรทัศน์และเสียง เล่ม 11 ความปลอดภัย ขึ้น

มาตรฐานผลิตภัณฑ์อุตสาหกรรมนี้กำหนดขึ้นโดยรับ IEC 60728-11(1997-02) Cabled distribution systems for television and sound signals-Part 11 : Safety และ Amendment 1(2000-10) มาใช้ในระดับเหมือนกันทุกประการ (identical) โดยใช้ IEC ฉบับภาษาอังกฤษเป็นหลัก

มาตรฐานผลิตภัณฑ์อุตสาหกรรมนี้กำหนดขึ้นเพื่อใช้ในการอ้างอิง และเพื่อให้ทันกับความต้องการของผู้ใช้มาตรฐาน ซึ่งจะได้แปลเป็นภาษาไทยในโอกาสอันสมควรต่อไป หากมีข้อสงสัยโปรดติดต่อสอบถามสำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม

คณะกรรมการมาตรฐานผลิตภัณฑ์อุตสาหกรรมได้พิจารณามาตรฐานนี้แล้ว เห็นสมควรเสนอรัฐมนตรีประกาศตามมาตรา 15 แห่งพระราชบัญญัติมาตรฐานผลิตภัณฑ์อุตสาหกรรม พ.ศ. 2511

ประกาศกระทรวงอุตสาหกรรม

ฉบับที่ 3324 (พ.ศ. 2548)

ออกตามความในพระราชบัญญัติมาตรฐานผลิตภัณฑ์อุตสาหกรรม

พ.ศ. 2511

เรื่อง กำหนดมาตรฐานผลิตภัณฑ์อุตสาหกรรม

ระบบกระจายสัญญาณโทรทัศน์และเสียงด้วยเคเบิล

เล่ม 11 ความปลอดภัย

อาศัยอำนาจตามความในมาตรา 15 แห่งพระราชบัญญัติมาตรฐานผลิตภัณฑ์อุตสาหกรรม พ.ศ. 2511 รัฐมนตรีว่าการกระทรวงอุตสาหกรรมออกประกาศกำหนดมาตรฐานผลิตภัณฑ์อุตสาหกรรม ระบบกระจายสัญญาณโทรทัศน์และเสียงด้วยเคเบิล เล่ม 11 ความปลอดภัย มาตรฐานเลขที่ มอก. 2204-2547 ไว้ ดังมีรายละเอียดต่อท้ายประกาศนี้

ประกาศ ณ วันที่ 7 มีนาคม พ.ศ. 2548

พงษ์ศักดิ์ รักตพงศ์ไพศาล

รัฐมนตรีว่าการกระทรวงอุตสาหกรรม

มอก. 2204–2547
IEC 60728–11(1997–08)
(Amendment 1(2000–10))

มาตรฐานผลิตภัณฑ์อุตสาหกรรม
ระบบกระจายสัญญาณโทรทัศน์และเสียงด้วยเคเบิล
เล่ม 11 ความปลอดภัย

มาตรฐานผลิตภัณฑ์อุตสาหกรรมนี้กำหนดขึ้นโดยรับ IEC 60728–11(1997–02) Cabled distribution systems for television and sound signals–Part 11 : Safety และ Amendment 1(2000–10) มาใช้ในระดับเหมือนกันทุกประการ (identical) โดยใช้ IEC ฉบับภาษาอังกฤษเป็นหลัก

มาตรฐานผลิตภัณฑ์อุตสาหกรรมนี้เกี่ยวข้องกับระบบกระจายสัญญาณด้วยเคเบิลสำหรับสัญญาณโทรทัศน์ สัญญาณเสียง และสัญญาณสื่อประสมเชิงโต้ตอบ รวมทั้งบริภัณฑ์สำหรับ

.การรับ กระทำกระบวนการ และกระจายสัญญาณเสียงและโทรทัศน์และสัญญาณข้อมูลที่เกี่ยวข้องที่ต้นทางสัญญาณ

.กระทำกระบวนการ ต่อประสาน และส่งผ่านสัญญาณสื่อประสมเชิงโต้ตอบทุกชนิดที่ใช้สื่อส่งผ่านที่ใช้ได้

ครอบคลุมถึงระบบทุกชนิด เช่น

- ระบบโทรทัศน์สายอากาศร่วม (CATV)
- ระบบ MATV และ SMATV
- ระบบรับแต่ละระบบ

และบริภัณฑ์ทุกแบบที่ติดตั้งในระบบดังกล่าว

ขอบข่ายของมาตรฐานผลิตภัณฑ์อุตสาหกรรมนี้ขยายจากสายอากาศและช่องต่อเข้าของแหล่งกำเนิดสัญญาณพิเศษให้ครอบคลุมถึงอุปกรณ์ต้นสัญญาณหรือจุดต่อประสานอื่น ระบบโดยรวม จนกระทั่งถึงช่องต่อออกของระบบหรือช่องต่อเข้าขั้วต่อ (ในกรณีที่ไม่มีช่องต่อออกของระบบ)

มาตรฐานผลิตภัณฑ์อุตสาหกรรมนี้ไม่ครอบคลุมถึงอุปกรณ์ปลายสายของผู้ใช้ (เครื่องปรับรับความถี่ เครื่องรับสัญญาณ เครื่องถอดรหัส อุปกรณ์ปลายสายสื่อประสม ฯลฯ)

มาตรฐานผลิตภัณฑ์อุตสาหกรรมนี้เกี่ยวข้องกับข้อกำหนดด้านความปลอดภัยที่ใช้ได้กับระบบติดในสถานที่ประจำที่และบริภัณฑ์ที่บรรยายข้างต้น ตราบเท่าที่เป็นไปได้ในทางปฏิบัติมาตรฐานผลิตภัณฑ์อุตสาหกรรมนี้ยังมีผลใช้ได้กับระบบเคลื่อนที่และระบบที่ติดตั้งชั่วคราว ตัวอย่างเช่น บ้านเคลื่อนที่

ข้อกำหนดเพื่อเติมอาจนำมาใช้ได้ เช่นที่เกี่ยวกับ

- การป้องกันระบบจ่ายไฟฟ้า (เหนือศีรษะหรือใต้ดิน)
- ระบบจ่ายบริการโทรคมนาคมอื่น ๆ
- ระบบจ่ายน้ำ
- ระบบจ่ายก๊าซ

มาตรฐานผลิตภัณฑ์อุตสาหกรรมนี้มีเจตนาเพื่อจัดให้มีความปลอดภัยของระบบ บุคคลที่ทำงานกับระบบ ผู้เช่าและบริภัณฑ์ผู้เช่า เป็นพิเศษ โดยเกี่ยวข้องเฉพาะกับด้านความปลอดภัยและไม่มีเจตนาที่จะกำหนดมาตรฐานสำหรับการป้องกันบริภัณฑ์ที่ใช้ในระบบ

รายละเอียดให้เป็นไปตาม IEC 60728–11(1997–08) และ Amendment 1(2000–10)

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

CABLED DISTRIBUTION SYSTEMS FOR TELEVISION AND SOUND SIGNALS –

Part 11: Safety

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, the IEC publishes International Standards. Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of the IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested National Committees.
3) The documents produced have the form of recommendations for international use and are published in the form of standards, technical reports or guides and they are accepted by the National Committees in that sense.
4) In order to promote international unification, IEC National Committees undertake to apply IEC International Standards transparently to the maximum extent possible in their national and regional standards. Any divergence between the IEC Standard and the corresponding national or regional standard shall be clearly indicated in the latter.
5) The IEC provides no marking procedure to indicate its approval and cannot be rendered responsible for any equipment declared to be in conformity with one of its standards.
6) Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. The IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 60728-11 has been prepared by subcommittee 100D: Cabled distribution systems, of IEC technical committee 100: Audio, video and multimedia systems and equipment.

The text of this standard is based on the following documents:

FDIS	Report on voting
100D/29/FDIS	100D/40/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

The following differences exist in some countries:

- 6: A common earthing is not permitted due to electrical earthing conditions (France).
- 6.2: Due to electrical earthing conditions, the outer conductors of coaxial cables entering and/or leaving a building shall not be bonded directly to a common equipotential bonding bar. The following applies: the galvanic isolation shall withstand a voltage of 1 kV r.m.s. during 1 min (France).

Equipotential bonding method is not used in Japan (Japan).

Earthing to gas networks as shown in figures 3 and 4 is not admitted (Japan, Poland).

- 8.1: The line powering voltage shall not exceed 65 V a.c. r.m.s. and the line-powering current shall not exceed 15 A (Japan).
- 9: The French regulation (arrêté interministériel, 2 April 1991) specifies, among many other parameters, the minimum distance between electric supply wires (isolated and not isolated, low-voltage and high-voltage) and any other installation (e.g. buildings, antennas, telecommunication lines, etc.). The main clauses of this regulation which concern the cabled distribution systems are clauses 12, 25, 26, 33, 33bis, 38, 49, 51, 52 and 63. Clause 9 of this standard specifies distances of 10 mm (indoors) and 20 mm (outdoors) and this is not sufficient to cover overhead cables. As an example, the minimum distance between an overhead telecommunication line and an overhead low-voltage (up to 1 kV) electricity supply line shall be 1 m (clause 33). This distance may be reduced under specific conditions (clauses 51, 52 and 63). This regulation specifies also the minimum distance from high-voltage lines. This distance varies from 1 m to 4 m depending on the voltage, on the isolation of the cable and on the location (built-up area or not) (clauses 33 and 63) (France).

For antennas in proximity of voltages up to 1000 V the following applies in Japan:

1) Low voltage, ≤600 V a.c. or ≤750 V d.c.:
   - cable: ≥30 cm distance;
   - isolated wire: ≥60 cm distance.

2) High voltage, >600 V a.c. or >750 V d.c.:
   - cable: ≥40 cm distance;
   - isolated wire: ≥80 cm distance

- 10: Resistance to equipotential point is not applied, because the bonding method is not used in Japan. Japanese regulation specifies to apply the safety terminal. Installation of a safety terminal at the junction point between the indoor cabling and the feeder cable of the distribution system is shown in figure 11 (Japan).

  11: A lightning protection system is applied in Japan for the protection against atmospheric overvoltages and for the elimination of potential differences. In Japan, installation of a lightning protection system is necessary in the case that the topmost height of the construction exceeds 20 m, except in those cases when the construction is inside the safety zone of another lightning protection system (see figure 12)(Japan).

- 11.1.1: An equipotential bonding conductor is not used, because the bonding method is not used in Japan (Japan).
- 11.2.2: An earth termination system is not used in Japan. Only a lightning protection system is applied (see figure 12) (Japan).
- 11.2.2: As the conductivity of earth in Finland is lower than what is normal in many other countries, the earthing electrodes in 11.2.2 should be as shown in figures 13 a), 13 b) or 13 c) (Finland).
- 11.2.3: The minimum cross-section of the earthing conductor is 6 mm^2 (Finland).

The earthing conductors have the following requirements (Japan):

1) Conductors for a lightning rod: ≥30 mm^2 Cu,

2) For earthing resistance ≤10 Ω, the diameter has to be at least 2,6 mm Cu.

3) For earthing resistance ≤100 Ω, indoors, the diameter has to be at least 1,6 mm Cu or the cross-sectional area has to be at least 2 mm^2 Cu.

For earthing resistance ≤100 Ω, outdoors, the diameter has to be at least 2,6 mm Cu or the cross-sectional area has to be at least 5,5 mm^2 Cu.

– 12.2: The bending moment of a mast up to 6 m is not applied in Japan. In Japan the mast shall not be destroyed by the following wind pressures (Japan):

1) For an antenna height h < 16 m, the wind pressure is $60\sqrt{h}$, in kilograms per square metre.

2) For h ≥ 16 m, the wind pressure is $120\sqrt[4]{h}$, in kilograms per square metre.

– 12.3: The required wind pressure value is 700 N/m^2 for buildings up to 30 m (Finland).

CABLED DISTRIBUTION SYSTEMS FOR TELEVISION AND SOUND SIGNALS –

Part 11: Safety

1 Scope

This part of IEC 60728 deals with the safety requirements applicable to fixed sited systems and equipment primarily intended for the reception, processing and distribution of sound signals, television signals and their associated data signals using all applicable transmission media. It covers all types of systems such as:

- community antenna television (CATV) systems,
- master antenna television (MATV) systems,
- individual receiving systems,

and all types of equipment installed in such systems.

As far as applicable it is also valid for mobile and temporarily installed systems, e.g. caravans.

Additional requirements may apply, for example in relation to:

- electricity distribution systems (overhead or underground),
- other telecommunication services distribution systems,
- water distribution systems,
- gas distribution systems,
- lightning protection systems.

This standard is valid for all items, from the receiving antennas to the system outlets (subscriber equipment input). This standard does not cover subscriber equipment.

This standard is intended to provide specifically for the safety of the system, personnel working on it, subscribers and subscriber equipment. It deals only with safety aspects and is not intended to define a standard for the protection of equipment used in the system.

2 Normative references

The following normative documents contain provisions, which through reference in this text, constitute provisions of this part of IEC 60728. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this part of IEC 60728 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid normative documents.

IEC 60050(826):1982, *International Electrotechnical Vocabulary (IEV) – Chapter 826: Electrical installations of buildings*
Amendment 1 (1990)
Amendment 2 (1995)

IEC 60065:1985, *Safety requirements for mains operated electronic and related apparatus for household and similar general use*
Amendment 2 (1989)
Amendment 3 (1992)

IEC 60364: *Electrical installations of buildings*

IEC 60364-5-54:1980, *Electrical installations of buildings – Part 5: Selection and erection of electrical equipment – Chapter 54: Earthing arrangements and protective conductors*
Amendment 1 (1982)

IEC 60529:1989, *Degrees of protection provided by enclosures (IP Code)*

IEC 60825-1:1993, *Safety of laser products – Part 1: Equipment classification, requirements and user's guide*

IEC 61024-1:1990, *Protection of structures against lightning – Part 1: General principles*

3 Definitions

For the purpose of this part of IEC 60728, the following definitions apply.

3.1
cabled distribution system (for television and sound signals)
the general overall term used to define CATV systems, MATV systems and individual receiving systems.

3.2
CATV system or community antenna television system
a system designed to provide sound and television signals to communities.

3.3
MATV system or master antenna television system
a system designed to provide sound and television signals to households in one or more buildings.

3.4
individual receiving system
a system designed to provide sound and television signals to an individual household.

3.5
head-end
equipment, which is connected between receiving antennas or other signal sources and the remainder of the cabled distribution system, to process the signals to be distributed.

3.6
receiving antenna
a device with proper electrical characteristics that intercepts desired signals in the atmosphere and transfers these to the remainder of the cabled distribution system.

3.7
feeder
a transmission path forming part of a cabled distribution system. Such a path may consist of a metallic cable, optical fibre, waveguide or any combination of them. By extension, the term is also applied to paths containing one or more radio links.

3.8
spur feeder
a feeder to which splitters, subscriber taps or looped system outlets are connected.

3.9
amplifier
a device to compensate for attenuation.

3.10
splitter (spur unit)
a device in which the signal power at the (input) port is divided equally or unequally between two or more (output) ports.

NOTE – Some forms of this device may be used in the reverse direction for combining signal energy.

3.11
subscriber tap
a device for connecting a subscriber feeder to a spur feeder.

3.12
system outlet
a device for interconnecting a subscriber feeder and a receiver lead.

3.13
receiver lead
a lead which connects the system outlet to the subscriber equipment.

3.14
subscriber feeder
a feeder connecting a subscriber tap to a system outlet or, where the latter is not used, directly to the subscriber equipment.

3.15
subscriber equipment
equipment at the subscriber premises such as receivers, tuners, decoders, video recorders.

3.16
transfer point
an interface between the cabled distribution network and the building's internal network, each of which may be separately owned. The transfer point may contain a voltage-dependent device and/or galvanic isolator.

3.17
galvanic isolator
a device providing electrical isolation below a certain frequency range.

3.18
surge suppressor
a device designed to limit the surge voltage between two parts within the space to be protected, such as spark gap, surge diverter or semiconductor device. [IEC 61024-1]

3.19
attenuation
the decibel ratio of the input power to the output power.

3.20
earthing terminal
the connection point by means of which the earthing or grounding of a conducting part of an equipment is accomplished.

3.21
earth electrode
a conductive part or a group of conductive parts in intimate contact with and providing an electrical connection with earth. [IEV 826-04-02]

3.22
protective conductor (symbol PE)
a conductor required by some measures for protection against electric shock for electrically connecting any of the following parts:

- exposed conductive parts;
- extraneous conductive parts;
- main earthing terminal;
- earth electrode;
- earthed point of the source or artificial neutral. [IEV 826-04-05]

3.23
earthing conductor
a protective conductor connecting the main earthing terminal or bar to the earth electrode. [IEV 826-04-07]

3.24
neutral conductor (symbol N)
a conductor connected to the neutral point of a system and capable of contributing to the transmission of electrical energy. [IEV 826-01-03]

3.25
equipotential bonding conductor
a protective conductor for ensuring equipotential bonding. [IEV 826-04-10]

3.26
equipotential bonding
electrical connection putting various exposed conductive parts and extraneous conductive parts at a substantially equal potential. [IEV 826-04-09]

3.27
equipotential bonding bar
a bar to which e.g. extraneous conductive parts (see IEV 826-03-03), metal sheet of electrical power and telecommunication cables and other cables can be bonded.

3.28
lightning protection system (LPS)
the complete system used to protect a space against the effects of lightning. It consists of both external and internal lightning protection systems.

NOTE – In particular cases, an LPS may consist of an external LPS or an internal LPS only. [IEC 61024-1]

3.29
"natural" component of an LPS
a component which performs a lightning protection function but is not installed specifically for that purpose.

NOTE – Some examples of the use of this term are as follows:
- "natural" air-termination,
- "natural" down-conductor,
- "natural" earth electrode. [IEC 61024-1]

3.30
earth-termination system
that part of an external earthing system which is intended to conduct and disperse current in the earth. [IEC 61024-1, modified]

3.31
metal installation
extended metal items in the space to be protected which may form a path for lightning current, such as pipe-work, staircases, elevator guide rails, ventilation, heating and air conditioning ducts, and interconnected reinforcing steel. [IEC 61024-1]

3.32
safety distance
the minimum distance between two conductive parts within the space to be protected between which no dangerous sparking can occur. [IEC 61024-1]

3.33
main earthing terminal; main earthing bar
a terminal or bar provided for the connection of protective conductors, including equipotential bonding conductors and conductors for functional earthing, if any, to the means of earthing. [IEV 826-04-08]

4 General requirements

The cabled distribution system shall be so designed, constructed and installed as to present no danger, either in normal use or under any single-fault condition, to subscribers, personnel working on or externally inspecting the system, or to any other person, providing particularly:

- personal protection against electric shock;
- personal protection against physical injury;
- protection against fire.

For further details, see IEC 60364 series.

NOTE – For service and operation conditions, the above does not apply to trained, authorized personnel working on the equipment, who may be exposed to live parts of the equipment by the removal of protective covers.

4.1 Mechanical requirements

All parts of the system shall be so constructed that there is no danger of physical injury from contact with sharp edges or corners.

4.2 Access

A standard test finger shall not make contact with any live part or parts of the system which are accessible to the general public without first removing a protective cover by the use of a tool. The standard test finger is defined in IEC 60065.

4.3 Laser radiation

If equipment embodying laser products is used, special attention shall be paid to radiation safety. Specific requirements and recommendations are under consideration. Refer to IEC 60825-1.

5 Weather protection

All equipment and cables exposed to weather, especially corrosive atmosphere, adverse temperature or other adverse conditions shall be so constructed or protected as may be necessary to prevent danger arising from such exposure.

If, in conditions of sunshine falling on parabolic antennas, solar radiation is focused near the feed end of the network of the parabolic reflector such that burning may occur, the equipment shall be fitted with a warning notice in a clearly visible position.

6 Equipotential bonding and earthing

6.1 General requirements

The cabled distribution system shall be designed and constructed in accordance with the requirements of the IEC 60364 series so that no hazardous voltages can be present on the outer conductors of any cable or accessible metalwork of any equipment, including passive items. The requirements for the system outlet are specified in clause 10; the requirements for bonding and lightning protection of antenna systems in clause 11.

These bonding requirements are intended to protect only the cabled system and shall not be considered as providing protection against electric shock from electrical installations.

Earthing points or earthing and bonding systems shall be designed and constructed in accordance with the requirements of IEC 60364-5-54.

Where cabled distribution systems are installed outdoor on the same poles as those of the electric supply, a common earthing may be used.

6.2 Equipotential bonding mechanisms

Metallic enclosures for mains-supplied equipment, except on subscriber premises, shall be bonded. An example of bonding units within the enclosure is shown in figure 1. Metallic enclosures on subscriber premises shall be bonded in accordance with IEC 60364-5-54.

Where direct connection to an earthing system is not suitable because balancing currents are expected to flow in the outer conductor, for example in extensive horizontally cabled distribution systems, special protection shall be provided.

This protection shall be achieved, as shown in figure 2, either by

- mounting the equipment within a non-metallic enclosure, or
- fitting a voltage-dependent device to the system between the metallic enclosure and the local earth such that hazardous voltages shall be removed from the outer conductor and accessible metalwork of the system.

A suitable warning notice shall be provided inside the enclosure.

If the balancing currents in the conductors exceed the maximum current allowed by the manufacturer of the cable and/or the manufacturer of the cable connectors used in the system, galvanic isolation shall be introduced as described hereafter.

Where galvanic isolation is provided between sections of the network to eliminate balancing currents due to local potential differences, the outer conductors of each isolated section shall be connected to an earthing system.

NOTE 1 – The galvanic isolator may be liable to radiate or pick up high-frequency energy, and can be damaged by overvoltages.

The outer conductors of coaxial cables entering and/or leaving a building shall be bonded directly to a common equipotential bonding bar, either at the equipment or separately. The subscriber feeder cables need not be bonded if a galvanic isolator or fully isolated outlets (see clause 10) or transfer points are used. Examples are shown in figures 3, 4 and 5.

Where bonding is not possible and in order to avoid balancing currents between the cabled distribution system and the building installation, a galvanic isolator shall be used. An example is shown in figure 5.

NOTE 2 – The galvanic isolator may be liable to radiate or pick up high-frequency energy and can be damaged by overvoltages.

Provision shall be made to maintain continuity of the outer conductor system while units are changed or removed. An example is shown in figure 6.

The equipotential bonding conductor connected to the main earthing terminal shall be mechanically stable, comply with IEC 60364-5-54 and shall have a minimum cross-sectional area of 4 mm^2 Cu.

Every connection of a protective conductor or an earthing conductor to an earthing terminal shall be readily accessible and soundly made by the use of crimps, clamps, welds or hard soldered joints.

All metallic enclosures, housings, mounting bays, racks and mains-supplied equipment of metallic construction, shall be provided with an external earthing terminal, as shown in figures 7 and 8, complying with the relevant clauses of IEC 60065.

NOTE 3 – Line-powered amplifiers, taps, splitters and transfer points may also be fitted with earthing terminals.

7 Mains-supplied equipment

7.1 Equipment

The devices used in a cabled distribution system shall meet the requirements of IEC 60065, class II equipment. Exceptionally, class I equipment can be used.

Devices installed outdoors and operated from the mains supply shall be so constructed that the harmful effects of moisture, water, dust, etc. are prevented. Alternatively, they shall be installed in an appropriate drip-proof, splash-proof or watertight enclosure so as to provide the appropriate degree of protection (see IEC 60529).

7.2 Connection to the mains supply

The mains supply shall conform to the requirements of IEC 60364.

The connection of class II equipment to the mains supply shall be only bipolar. The protective conductor, if any, of class II equipment shall not be connected to the mains protective conductor.

If class II equipment is provided with a flexible power cable, then, either it shall be fitted with a bipolar plug, i.e. without a contact to the protective conductor or, where the power system requires the presence on the plug of a third (protective conductor) pin to gain access to the supply, no connection shall be made to that third pin. An example is shown in figure 8.

NOTE – If different potentials build up between the protective conductor and the equipotential bonding terminal, e.g. in older buildings, no balancing currents shall flow and produce excessive heat.

8 Network powering of the cabled distribution system

8.1 Line-powering

The line-powering voltage between the inner and outer conductors of the feeder cable shall not exceed 65 V r.m.s. The following conditions shall be met:

- line-powering shall be confined to feeders only and shall not extend to the subscriber feeder;
- the line-powering voltage shall be completely inaccessible to the public;
- the line-powering voltage shall be accessible to authorized personnel only after removal of equipment covers by means of a tool.

A true r.m.s. reading instrument shall be used to determine this voltage.

8.2 Power from subscriber premises

Where back-powering to a network or to outdoor equipment such as preamplifiers, low noise converters, polarizers in antenna installations is incorporated, the system shall comply with the following requirements:

- the maximum voltage applied between the inner and outer conductors of the subscriber feeder shall not exceed 24 V a.c. r.m.s. or 34 V d.c.;
- a true r.m.s. reading instrument shall be used to determine the a.c. voltage;

- the equipment shall be so designed and constructed that no dangerous currents can flow under normal operating or single-fault conditions;
- the equipment providing the power shall, if that power is derived from a mains supply, comply with all the relevant clauses of IEC 60065 as specified in clause 7. If fully isolated system outlets or transfer points (see clause 10) are used, only class II equipment shall be used to provide back-power;
- repointing motors and de-icing devices are normally separately fed. Specific requirements and recommendations are not specified here. Please refer to IEC 60065.

9 Protection against contact and proximity to electric power distribution systems

These protection requirements are intended, where no local regulations exist, to protect cabled distribution systems against potentially hazardous voltages which may be present adjacent to electric power distribution systems.

When parts of the outdoor antenna system are in proximity to electric power distribution systems in open air with voltages up to 1000 V, the following requirements shall be met:

- the horizontal distance between antenna support structures or masts and electric power distribution systems shall be no less than 1 m;
- the distance between parts of the antenna and electric power distribution systems shall be no less than 1 m. This value provides sufficient margin that the swinging of the electric power cables need not be taken into account.

The distance between parts of the cabled system and uninsulated parts, including all supporting structures, of an electric power distribution system carrying voltages between 50 V and 1000 V shall be at least 10 mm if indoors and 20 mm when installed outside.

This distance may be less only if there is sufficient insulating material, e.g. cable with insulating jacket, between the conductors of the two systems, thus guaranteeing that these conductors do not touch each other.

For systems carrying voltages of more than 1 kV, the distances shall be larger unless sufficient insulation is provided to prevent arcing. Requirements and recommendations are under consideration.

10 System outlets and transfer points

The subscriber equipment can be connected to the cabled distribution systems directly or by means of system outlets and/or transfer points. These devices provide the necessary safety protection between the subscriber equipment and the cabled distribution system.

NOTE – Except in the case of fully isolated outlets (see 10.1.1), the achieved protection depends on equipotential bonding of the outer conductor of the subscriber feeder. It should be pointed out that, under certain combinations of fault conditions and when using class I equipment, the outer conductor of the subscriber feeder can act as a protective conductor of the electricity supply with, the result that large fault currents may flow for a considerable period of time, depending on the protection provided in the electrical distribution system.

Where system outlets or transfer points are not used, protection shall be provided at the output of the subscriber tap.

Where safety protection is provided by means of isolating capacitors or transformers, the complete device shall comply with the relevant requirements of IEC 60065.

10.1 System outlet

There are four types of system outlets in common use, providing varying degrees of protection against electric shock, but also more or less liable to radiate or pick up high-frequency energy.

10.1.1 Fully isolated system outlet

This type of outlet incorporates isolating components in series with both the inner and the outer conductors of the coaxial connectors. The isolating components may be either high-voltage capacitors or double-wound transformers.

NOTE – System outlets of this type are liable to radiate or pick up high-frequency energy.

10.1.2 Semi-isolated system outlet

This type of outlet incorporates an isolating component in series with the inner conductor only of the coaxial connector. If this outlet is used, the protection shall be provided by equipotential bonding of the outer conductor of the subscriber feeder. In this case, the d.c. resistance between the outer conductor of the connector and the nearest network equipotential bonding point shall be less than 5 Ω. The isolating component may be either a high-voltage capacitor or a double-wound transformer.

10.1.3 Non-isolated system outlet with protective element

This type of outlet does not incorporate any series isolation. Protection shall be provided by equipotential bonding as in 10.1.2. A protective element to improve safety (e.g. an RF coil) shall be connected between the inner and outer conductors of the coaxial connectors. The d.c. resistance of this protective element shall be less than 1 Ω.

The d.c. resistance between the outer conductor of the connector(s) and the nearest network equipotential point shall be less than 5 Ω.

10.1.4 Non-isolated system outlet without protective element

This type of outlet incorporates coaxial connector(s) only and does not contain any isolation component or protective element. This type of system outlet is used when back-powering from the subscriber equipment is required. The protection shall be provided by equipotential bonding as in 10.1.2.

10.2 Transfer point

This device can also provide varying degrees of protection against electric shock, depending on the elements incorporated. The same requirements as for the system outlet are applicable.

NOTE – Fully isolated transfer points are liable to radiate or pick up high-frequency energy.

11 Protection against atmospheric overvoltages and elimination of potential differences

These protection requirements are intended, where no local regulations exist, to protect antenna systems, including satellite antennas against static atmospheric overvoltages and lightning discharges.

These protection requirements shall not be considered as providing protection for buildings or any other structures.

The following cases are excluded:

- antenna systems external to the building which are located more than 2 m below the apex of the roof and less than 1,5 m from the building;
- antenna systems enclosed within the building structure.

Antennas shall not be installed on buildings having roofs covered with highly flammable materials (e.g. thatch, reed-like material and so on).

Antenna cables and earthing conductors shall not be laid in areas used for the storage of easily ignitable materials such as hay, straw and similar substances, or in areas in which explosive gases can develop or collect.

AM sound broadcasting receiving antennas shall incorporate a protective device connected to a bonding conductor.

11.1 Protection of the antenna system

11.1.1 Building equipped with a lightning protection system (LPS)

If the building is equipped with an LPS conforming to IEC 61024-1, the antenna mast, being a metal installation, shall be connected to the building's LPS via the shortest possible path and using an earthing conductor as specified under 11.2.

The outer conductors of all coaxial cables coming from the antennas shall be connected to the mast via an equipotential bonding conductor having a minimum cross-sectional area of 4 mm^2 Cu (see figure 8).

11.1.2 Building not equipped with an LPS

If the building is not equipped with an LPS conforming to IEC 61024-1, the mast and outer conductors of the coaxial cables shall be earthed as specified in 11.2.

For individual receiving systems, or MATV systems confined to one building where, due to low lightning probability, local regulations allow it, protection against lightning is not necessary but only recommended.

11.2 Earthing and bonding of the antenna system

11.2.1 Earthing and bonding mechanisms

The mast and the outer conductors of the coaxial cables shall be connected to earth via earthing conductors using the shortest possible path. The formation of loops shall be avoided. The earthing conductors shall be installed straight and vertical such that they can provide the shortest, most direct path to the earth termination system.

11.2.2 Earth termination system

The earth termination system shall be provided by one of the following methods as shown in figure 9:

- connection to the building's lightning protection system;
- connection to the building's earthing system;
- connection to a minimum of two horizontal electrodes of at least 5 m in length, or a vertical or inclined electrode of at least 2,5 m buried at a depth of at least 0,5 m, not closer than 1 m to the walls. The minimum cross-sectional area of each electrode is 50 mm^2 Cu or 80 mm^2 Fe.

"Natural" components such as interconnected concrete reinforcing steel or other suitable underground metal structures, incorporated in the building's foundation and whose dimensions comply with the above-mentioned limits, can also be employed.

Other earth termination systems according to IEC 61024-1 are also allowed.

11.2.3 Earthing conductors

A suitable earthing conductor is a single solid wire having a minimum cross-sectional area of not less than 16 mm^2 Cu insulated or bare, or 25 mm^2 insulated Al or 50 mm^2 insulated Fe.

"Natural" components can be employed, for example (see figure 9):

- metal installations such as continuous metallic water supply pipes or continuous metallic heating pipes, provided that
  - local regulations allow it,
  - electrical continuity between various parts is made durable,
  - their dimensions are at least equal to those specified for standard earthing conductors,
- the metal framework of the structure;
- the interconnected steel of the structure;
- facade elements, profiled rails and sub-constructions of metal facades, provided that
  - their dimensions comply with the requirements for down conductors and their thickness is not less than 0,5 mm,
  - their electrical continuity in a vertical direction is assured (joints shall be made secure by such means as brazing, welding, crimping, screwing or bolting) or the distance between the metal parts does not exceed 1 mm and the overlap between two elements is at least 100 cm^2.

The following are specifically excluded:

- protective earth and/or neutral conductors of the electricity supply;
- the outer conductor of any coaxial cable.

11.3 Overvoltage protection

Induction can introduce high voltages at transfer points, system outlets, at the head-end of the cabled distribution system or at the input of subscriber equipment. Protection can be achieved e.g. by equipotential bonding via surge suppressors. Requirements and recommendations are under consideration.

12 Mechanical stability

12.1 General requirements

This standard deals only with the mechanical stability of outdoor antenna systems, including satellite antennas.

All parts of the antenna system shall be so designed that they will withstand the maximum wind forces defined below, without breakage and without any of the components being torn away.

12.2 Bending moment

For antenna systems with masts up to a maximum free length of 6 m, as shown in figure 10, the bending moment at the fixing point shall not exceed 1650 Nm. The wind load of the mast shall be included. The fixed part of the mast should be at least one-sixth of the free length.

NOTE – Where the length is greater than 6 m or where it is anticipated that this bending moment will be exceeded, or if other fixing methods are used, the services of a qualified person who can guarantee the safety of the structure and/or building, should be employed. Local regulations can require that the stability of the specific area where the mast is attached to the building is verified.

12.3 Wind pressure values

For the purpose of establishing mast loadings, the following values can be used in the absence of specific local regulations:

- if antenna systems are established within 20 m of ground level, the value of p (wind pressure) shall be assumed to be 800 N/m^2 (wind speed 36 m/s or approximately 130 km/h);
- if antenna systems are established higher than 20 m above ground level, the value of p (wind pressure) shall be assumed to be 1100 N/m^2 (wind speed 42 m/s or approximately 150 km/h).

The wind load on the antenna shall be calculated as follows:

$$W = c\,p\,A$$

where

W is the wind load, in newtons;

c is the load coefficient;

p is the wind pressure, in pascals (N/m^2);

A is the component area, in square metres.

The coefficient c to be used is 1,2.

Loading due to snow and ice is not considered.

NOTE – Adverse environmental conditions or local regulations may require that a higher or lower wind pressure value is assumed, e.g.:
- for a wind speed of 45 m/s (160 km/h) the wind pressure shall be 1250 N/m^2;
- for a wind speed of 56 m/s (200 km/h) the wind pressure shall be 1900 N/m^2.

The bending moment at the fixing point shall be calculated as follows:

$$M_b = W_1\,a_1 + W_2\,a_2 + \ldots$$

where

M_b is the bending moment, in newton metres;

$W_1, W_2, \ldots$ is the wind load, in newtons;

$a_1, a_2, \ldots$ is the mast length from the antenna to the fixing point, in metres.

12.4 Mast construction

Where the mast is constructed from steel, the steel shall have a guaranteed extension limit and the maximum loading shall not exceed 90 % of the extension limit (0,9 $B_{0,2}$) so that the mast on being overloaded does not break but only buckles.

The minimum wall thickness of the mast in the fastening area shall be 2 mm.

12.5 Data to be published

The antenna manufacturer shall publish the following data for a wind pressure of p = 800 N/m^2:

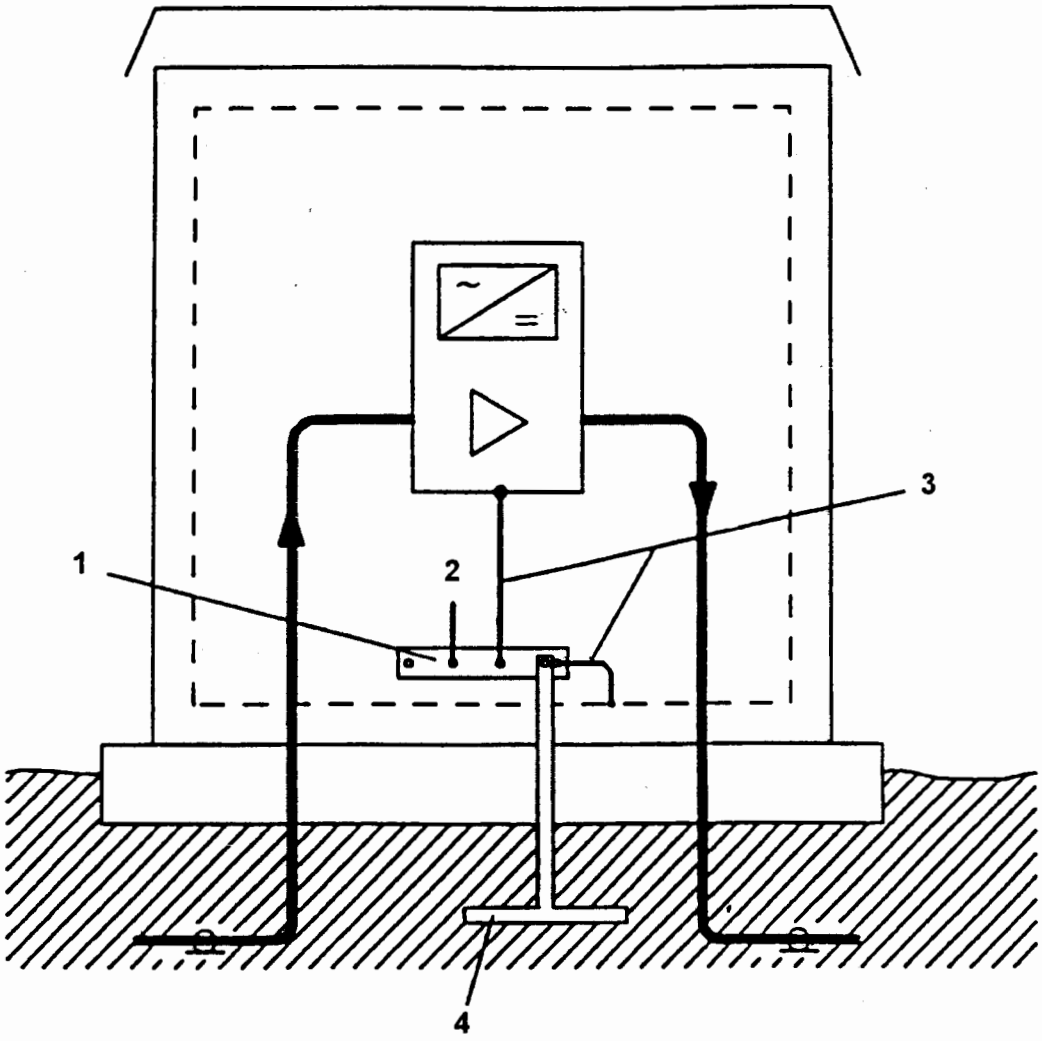
a) the wind load of the antennas;

b) the maximum bending moment of the masts at the fixing point.

NOTE – To convert the wind pressure of p = 800 N/m^2 to p = 1100 N/m^2 the factor is 1,37 (1100 : 800).

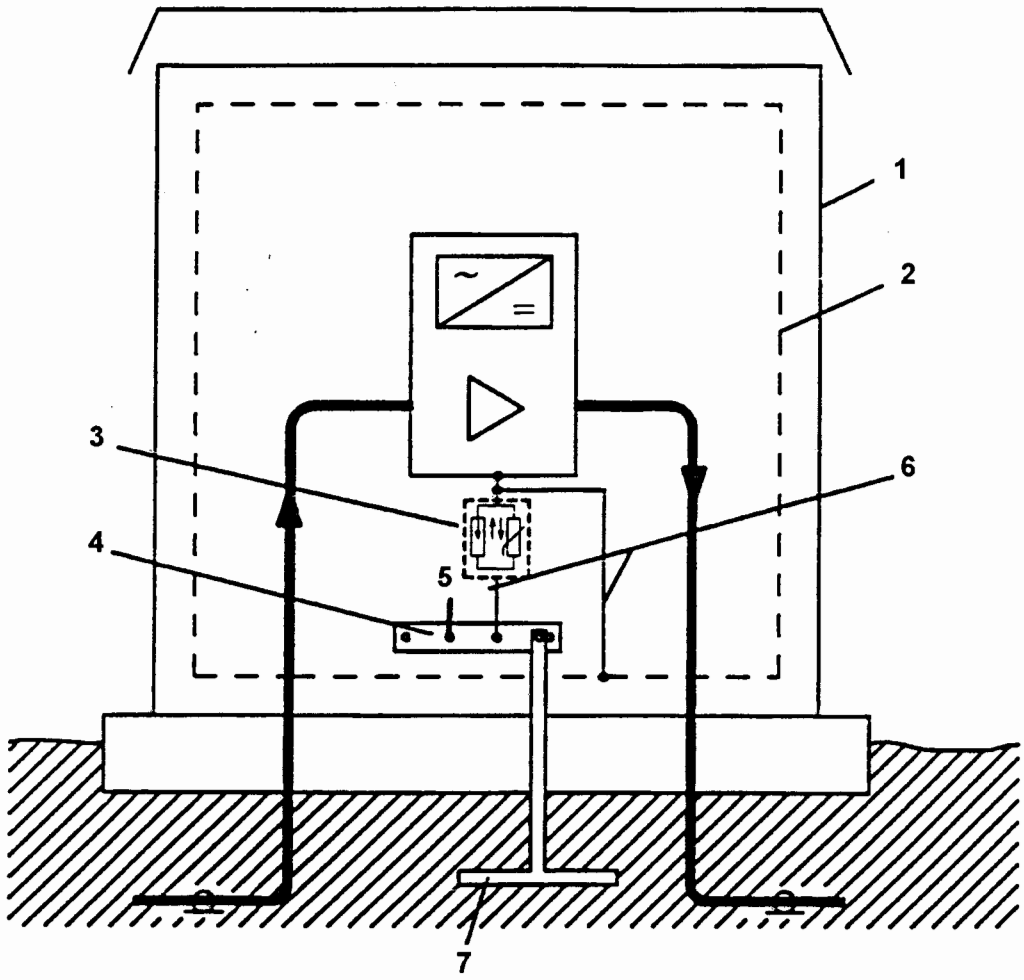
13 Laser radiation

Under consideration.



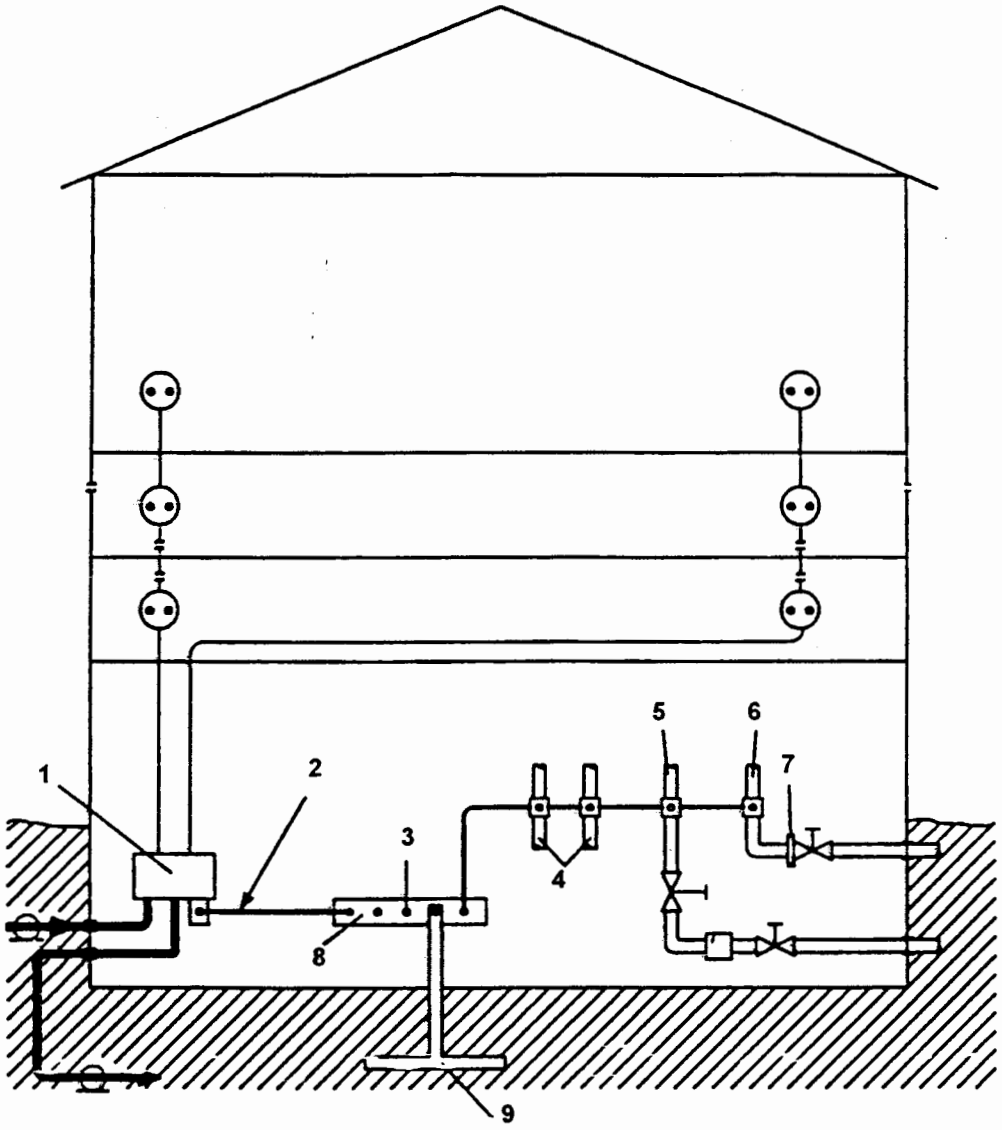
1 Equipotential bonding bar
2 Protective conductor
3 Equipotential bonding conductor
4 Earth electrode

Figure 1 – Example of equipotential bonding and earthing of a metal enclosure



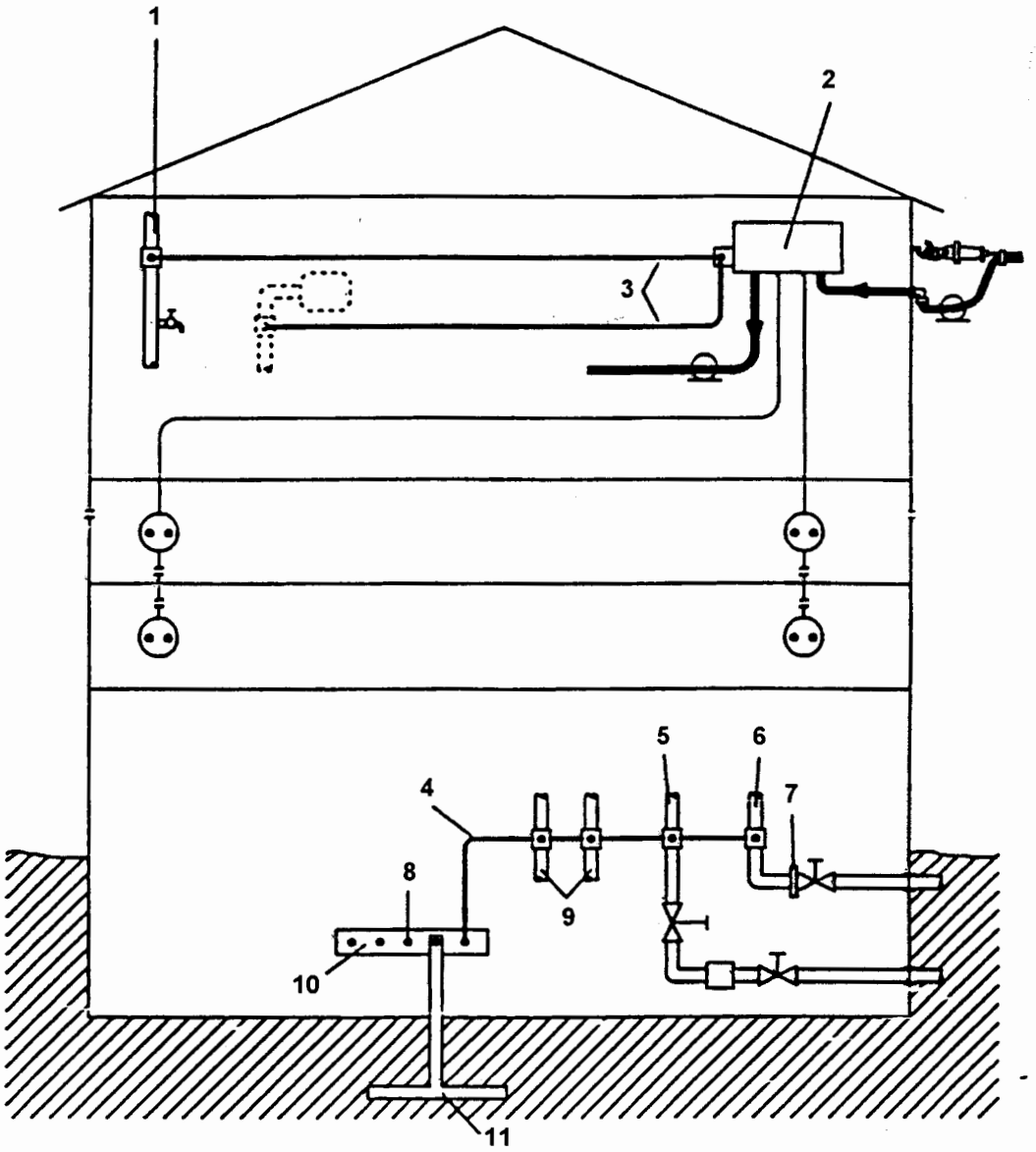
1 Non-metallic enclosure
2 Metallic enclosure
3 Voltage-dependent protective device
4 Equipotential bonding bar
5 Protective conductor
6 Equipotential bonding conductor
7 Earth electrode

Figure 2 – Example of equipotential bonding and indirect earthing of a metal enclosure via a voltage-dependent protective device (in case of balancing currents)



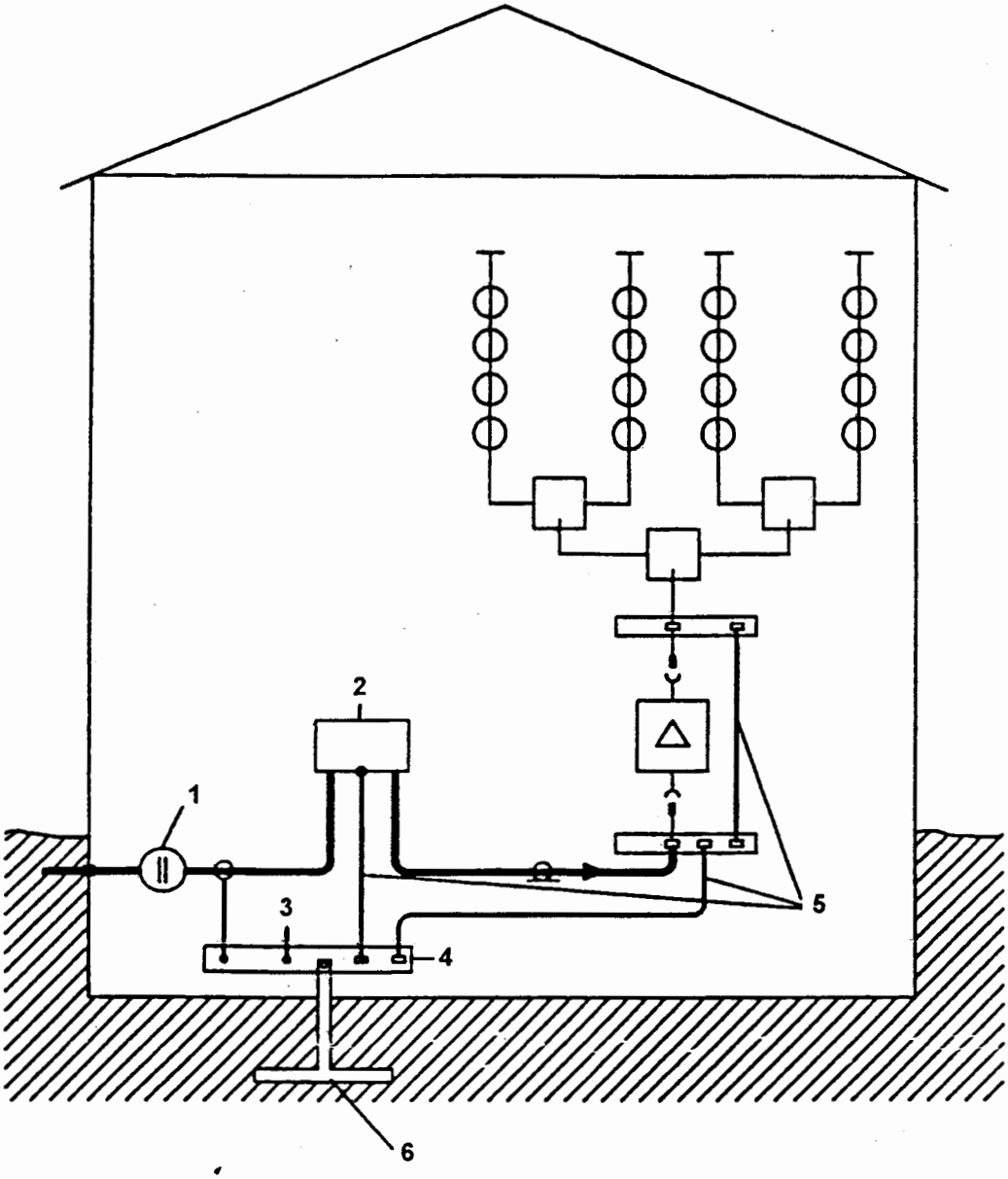
1 Subscriber tap
2 Equipotential bonding conductor
3 Protective conductor
4 Heating pipes
5 Water
6 Gas
7 Galvanic isolation
8 Equipotential bonding bar
9 Earth electrode

Figure 3 – Example of equipotential bonding and earthing of a building installation (underground connection)



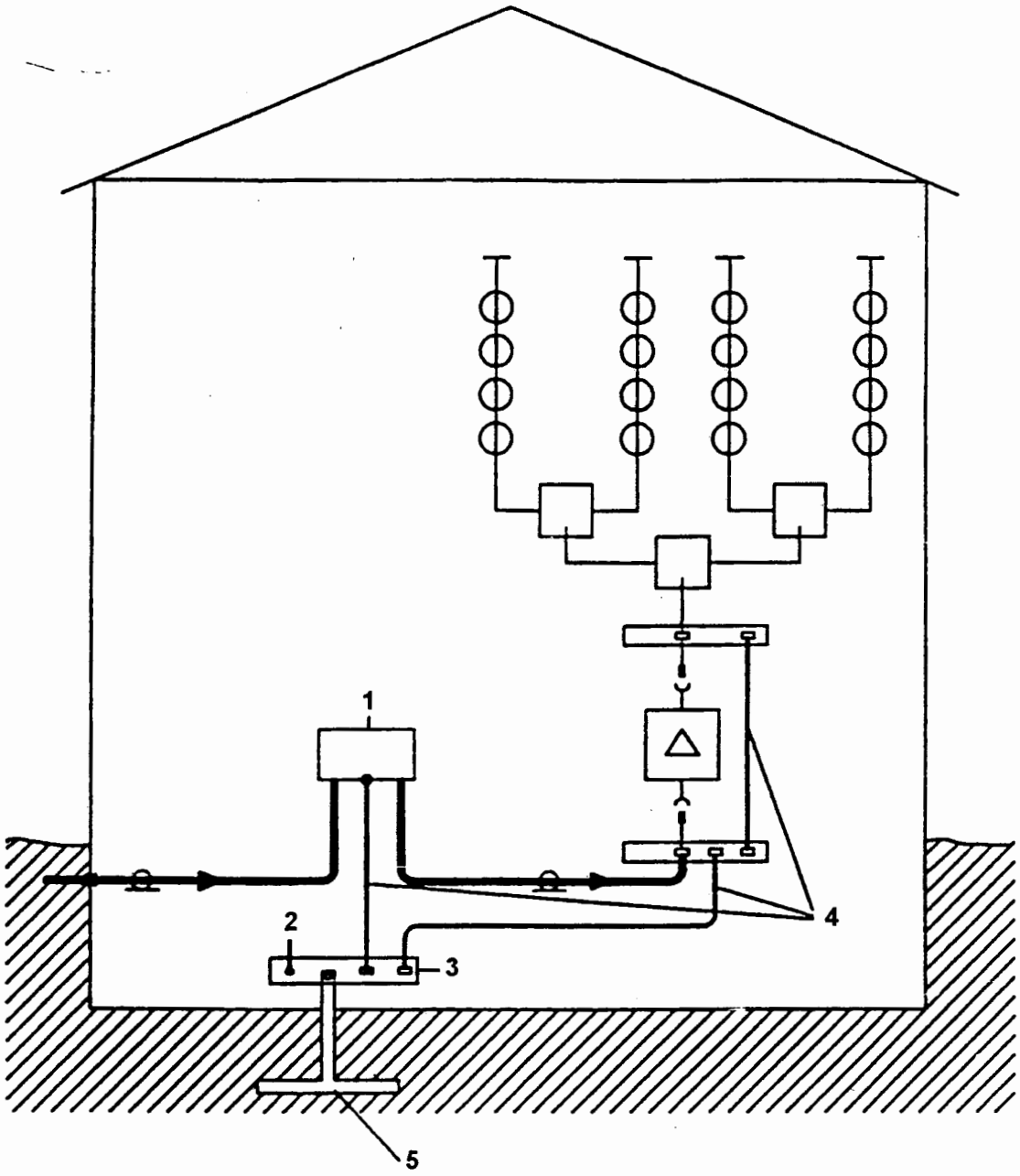
1 Example of connecting to continuous metallic water pipe or heating pipe
2 Wall-mounted subscriber tap
3 Equipotential bonding conductor
4 Equipotential bonding conductor
5 Water
6 Gas
7 Galvanic isolation
8 Protective conductor
9 Heating pipes
10 Equipotential bonding bar
11 Earth electrode

Figure 4 – Example of equipotential bonding and earthing of a building installation (above ground connection)



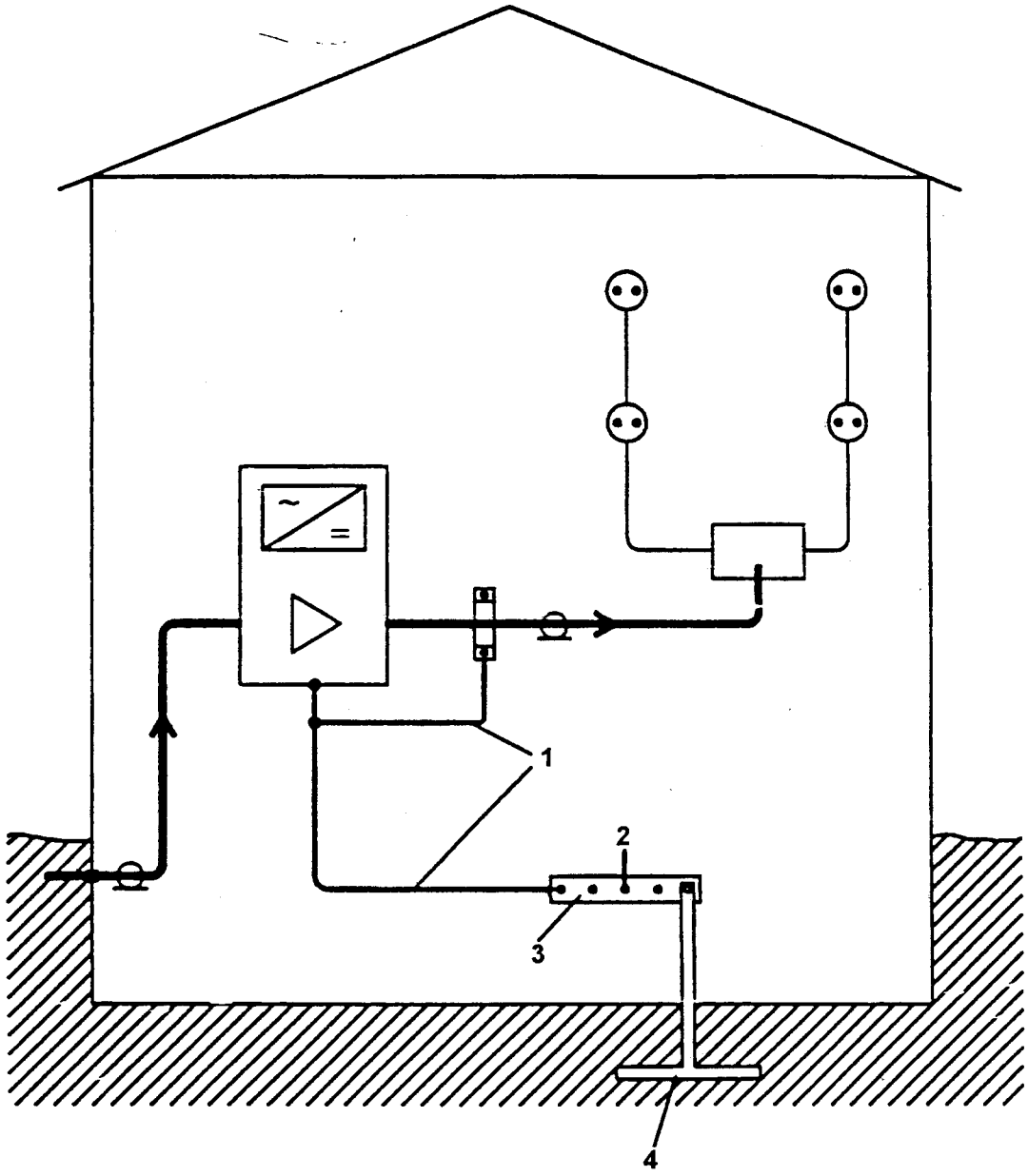
1 Galvanic isolator
2 Transfer point
3 Protective conductor
4 Equipotential bonding bar
5 Equipotential bonding conductor
6 Earth electrode

Figure 5 – Example of equipotential bonding with a galvanic isolated cable entering a building (underground connection)



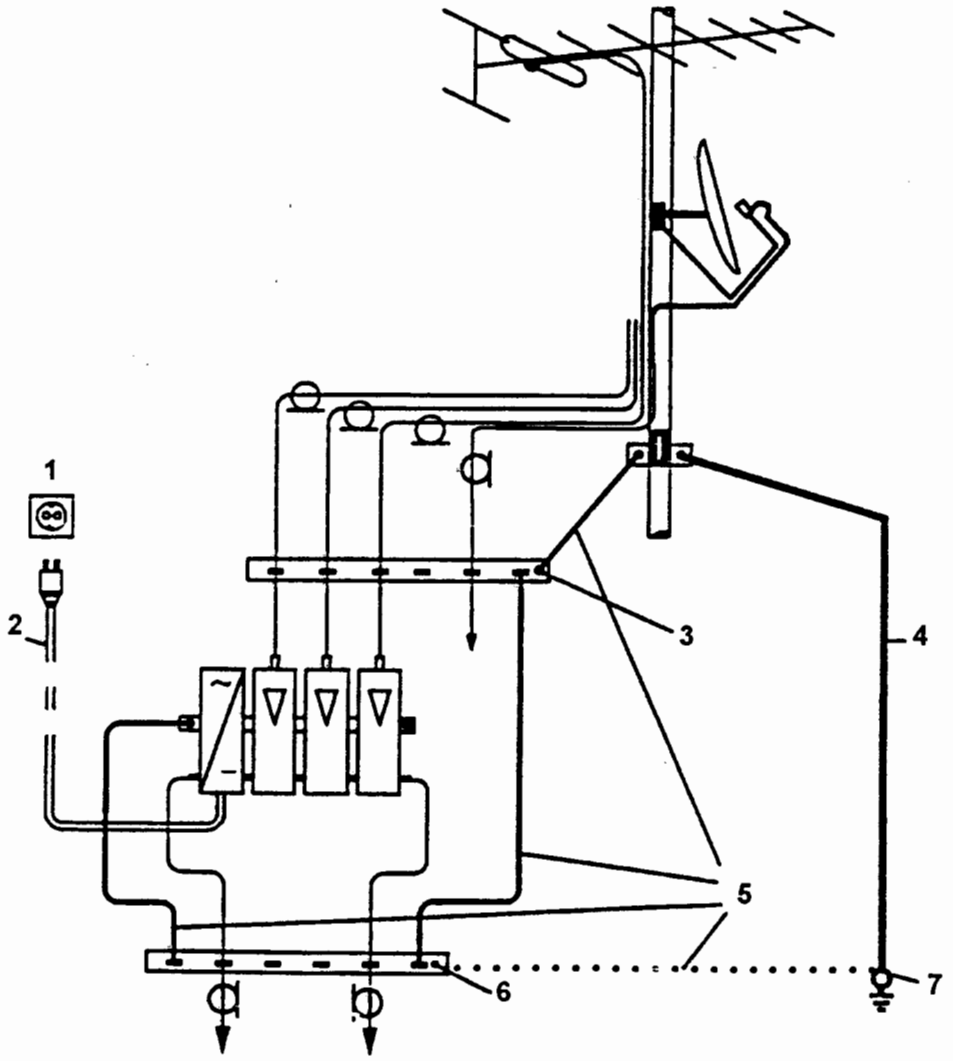
1 Transfer point
2 Protective conductor
3 Equipotential bonding bar
4 Equipotential bonding conductor
5 Earth electrode

Figure 6 – Example of maintaining of equipotential bonding whilst a unit is removed



1 Equipotential bonding conductor
2 Protective conductor
3 Equipotential bonding bar
4 Earth electrode

Figure 7 – Example of external safety equipotential bonding



1 Mains supply, e.g. 230 V
2 Bipolar
3 Equipotential bonding bar
4 Earthing conductor
5 Equipotential bonding conductor
6 Equipotential bonding bar
7 Earthing terminal

Figure 8 – Example of equipotential bonding of antennas and head-ends

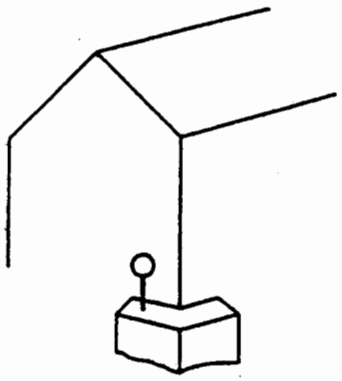


Figure 9 a -
Conductor in
building foundations

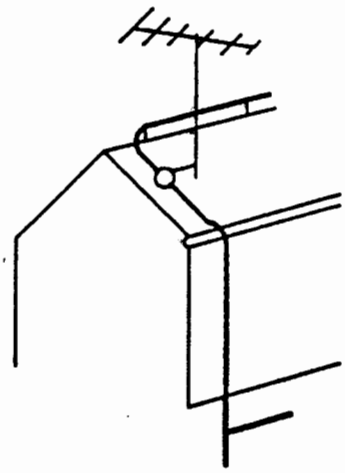


Figure 9 b -
Building lightning
protection system

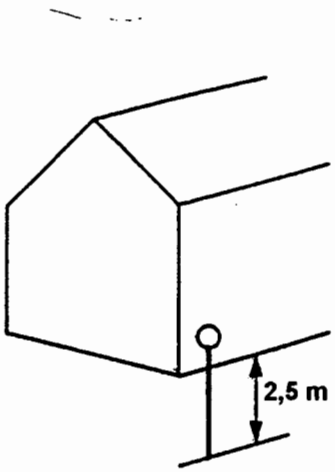


Figure 9 c -
Steel rod

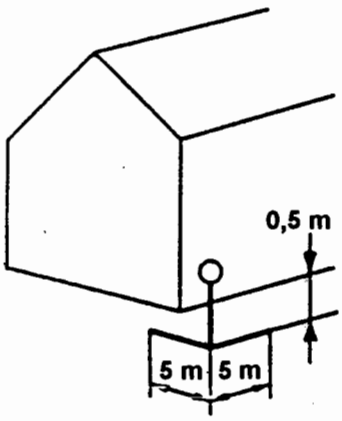


Figure 9 d -
Steel strip

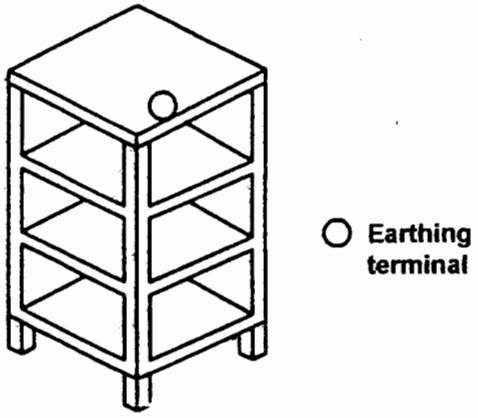


Figure 9 e -
Structural steel works

Figure 9 – Examples of earthing mechanisms

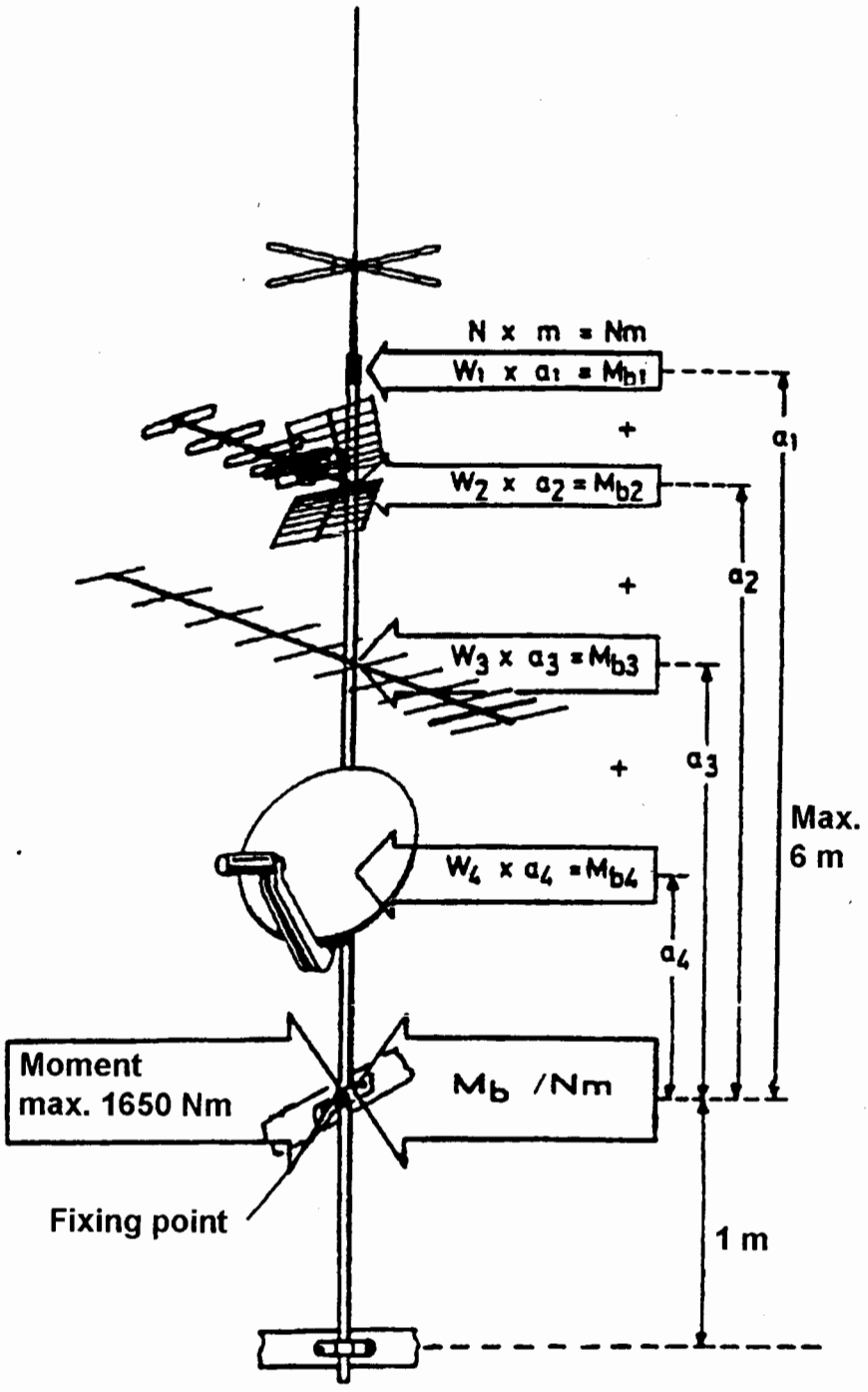
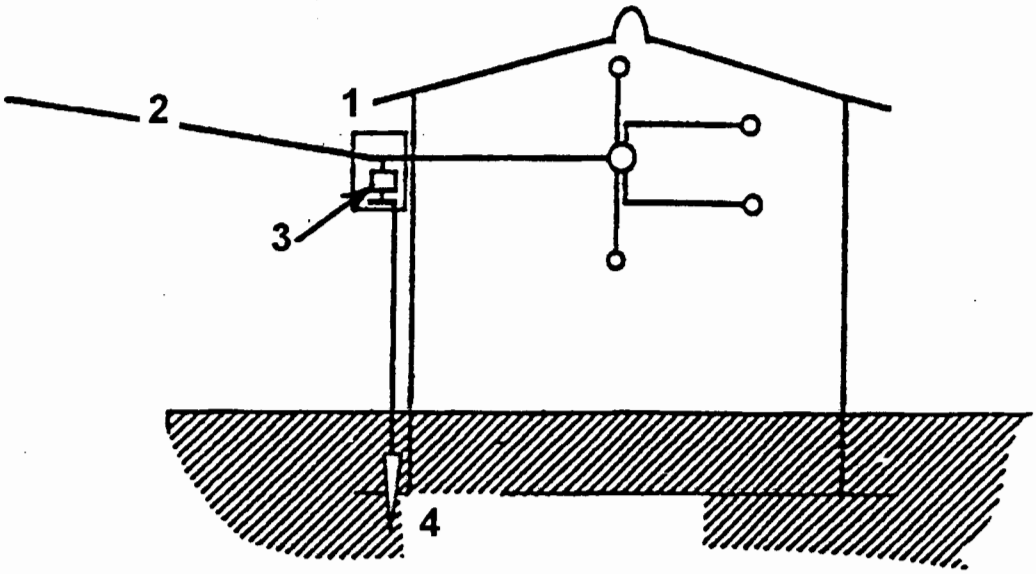
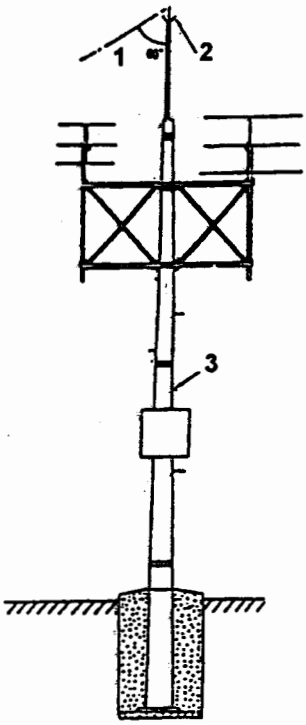


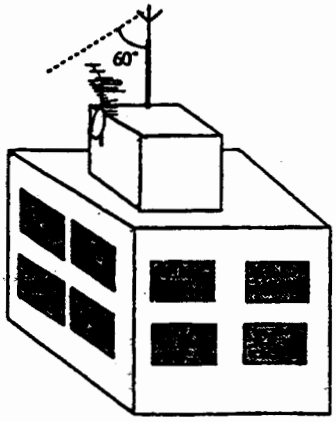
Figure 10 – Bending moment of an antenna mast



1 Safety terminal
2 Feeder cable
3 Protective device
4 Earthing conductor

Figure 11 – Example of the installation of a safety terminal in Japan





1 Safety zone
2 Lightning rod
3 Mast

Figure 12 a – Mast

Figure 12 b – Building

Figure 12 – Examples of installation of a lightning protection system in Japan

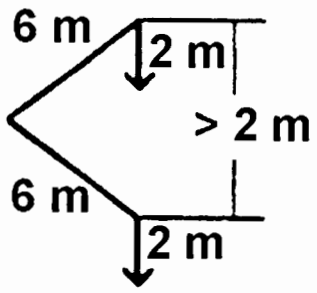


Figure 13 a

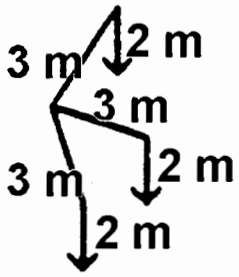


Figure 13 b

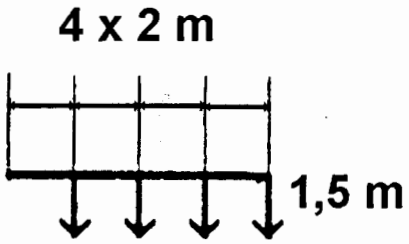


Figure 13 c

Figure 13 – Examples of earth electrodes in Finland

FOREWORD

This amendment has been prepared by subcommittee 100D: Cabled distribution systems, of IEC technical committee 100: Audio, video and multimedia systems and equipment.

The text of this amendment is based on the following documents:

FDIS	Report on voting
100/159/FDIS	100/181/RVD

Full information on the voting for the approval of this amendment can be found in the report on voting indicated in the above table.

The committee has decided that the contents of this publication will remain unchanged until 2003. At this date, the publication will be

- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

A bilingual version of this amendment may be issued at a later date.

Page 3

CONTENTS

Delete :

13 Laser radiation

Add:

Annex A (informative) Symbols

Annex B (informative) Abbreviations

Bibliography

Page 9

FOREWORD

Delete the second dashed item: "– 6.2: Due to electrical earthing conditions..."

Page 13

1 Scope

Replace the existing text of this clause by the following new text:

Standards of the IEC 60728 series deal with cabled distribution systems for television, sound and interactive multimedia signals including equipment

- for head-end reception, processing and distribution of sound and television signals and their associated data signals, and
- for processing, interfacing and transmitting all kinds of interactive multimedia signals using all applicable transmission media.

They cover all kinds of systems such as:

- CATV-systems,
- MATV- and SMATV-systems,
- individual receiving systems,

and all kinds of equipment installed in such systems.

The scope of these standards extends from antennas and special signal source inputs to the head-end or other interface points, to systems as a whole, up to system outlets or terminal inputs, where no system outlet exists.

The standardization of any user terminal (i.e. tuners, receivers, decoders, multimedia terminals, etc.) is excluded.

This part of IEC 60728 deals with the safety requirements applicable to fixed sited systems and equipment as described above. As far as applicable, it is also valid for mobile and temporarily installed systems, for example caravans.

Additional requirements may apply, for example in relation to:

- protection electricity distribution systems (overhead or underground);
- other telecommunication services distribution systems;
- water distribution systems;
- gas distribution systems;
- lightning systems.

This standard is intended to provide specifically for the safety of the system, personnel working on it, subscribers and subscriber equipment. It deals only with safety aspects and is not intended to define a standard for the protection of equipment used in the system.

2 Normative references

Add, to the existing list of normative references, the title of the following standard:

IEC 60825-2:1993, *Safety of laser products – Part 2: Safety of optical fibre communication systems*

Page 15

3 Definitions

Replace definition 3.1 by the following new definition:

3.1
cabled distribution system (for television and sound signals)
the general overall term used to define CATV-systems, MATV-systems, SMATV-systems and individual receiving systems

Page 21

Add the following new definition:

3.34
SMATV-system: Satellite Master Antenna Television distribution system
a system designed to provide sound and television signals, received by satellite receiving antenna eventually combined with terrestrial TV and/or radio signals, to households in one or more adjacent buildings

Page 23

4 General requirements

4.3 Laser radiation

Replace the existing text by the following new text:

If equipment embodying laser products is used, special attention shall be paid to radiation safety. Refer to IEC 60825-1 and IEC 60825-2 for requirements and recommendations.

6 Equipotential bonding and earthing

6.1 General requirements

Replace the second paragraph by the following new text:

These bonding requirements are intended to protect only the cabled system and shall not be considered to provide protection against electric shock (hazardous body currents) from electrical installations.

6.2 Equipotential bonding mechanisms

Replace, on page 25, the paragraph directly after note 2 by the following new text:

When changing or removing distribution equipment or coaxial cable, care shall be taken to avoid leakage currents from the subscriber equipment that can cause overvoltages between the interrupted parts (inner and/or outer conductors) by opening the loop. Provision shall be made to maintain continuity of the outer/inner conductor system while units are changed or removed to avoid electric shock (hazardous body currents). An example is shown in figure 6.

Page 27

7 Mains-supplied equipment

7.1 Equipment

Replace the first paragraph by the following new text:

The devices used in a cabled distribution system shall meet the requirements of IEC 60065, class II equipment.

Only where the equipment supply is protected by a residual leakage detector and there is no direct connection between the neutral supply and the protective earth, can class I equipment be used.

NOTE If different potentials build up between the protective conductor and the equipotential bonding terminal, for example in older buildings, the balancing currents shall not produce excessive heat.

8 Network powering of the cabled distribution system

8.1 Line-powering

Add the following new subclause heading 8.1.1 immediately after subclause 8.1 heading:

8.1.1 Maximum allowed line-powering voltages

Replace the first sentence of new subclause 8.1.1 (formerly 8.1) by:

The line-powering voltage between the inner and outer conductors of the feeder cable shall not exceed 65 V RMS and 120 V DC.

Add new subclause 8.1.2 as follows:

8.1.2 General provisions for equipment

The equipment shall be so designed and constructed that no dangerous current can flow under normal operating or single-fault conditions.

Page 29

9 Protection against contact and proximity to electric power distribution systems

Replace the last paragraph by the following new text:

For systems carrying voltages of more than 1 kV, the distance shall be at least 3 m. The cabled distribution system shall not cross over in open air any power distribution system carrying voltages of more than 1 kV.

Add, after the last paragraph, the following new text:

The installation of a power outlet and a system outlet in a common box is allowed only if the system outlet can be installed in such a way that the live parts of the electric power distribution system cannot be touched by the installer.

10 System outlets and transfer points

Replace the last paragraph by the following new text:

Where safety protection is provided by means of isolating capacitors or transformers, the isolated conductors, for example inner conductors, shall withstand a continuous DC test voltage of 2 120 V for a period of not less than 1 min and maintain an insulation resistance of not less than 3,0 MΩ.

NOTE Compliance with this requirement can be shown to be achieved if the current during the test does not exceed 0,7 mA.

The manufacturer shall design the isolating means in such a way that, under fault conditions of equipment connected to the outlet or transfer point, the AC leakage current (50 Hz or 60 Hz) does not exceed 8 mA RMS with an applied voltage of 230 V RMS.

Page 31

10.1 System outlet

Replace the existing text by the following new text:

There are four types of system outlets in common use providing varying degrees of protection against electric shock (hazardous body currents), but also more or less liable to radiate or pick-up high-frequency energy.

10.1.1 Fully isolated system outlet

Replace the first sentence by the following new text:

This type of outlet incorporates isolating components in series with both the inner and the outer conductors of the coaxial connections.

10.1.2 Semi-isolated system outlet

Replace the existing text by the following new text:

This type of outlet incorporates an isolating component in series with the inner conductors only of the coaxial connections. If this outlet is used, the protection shall be provided by equipotential bonding of the outer conductor of the subscriber feeder. In this case, the DC resistance between the outer conductor of the connection and the nearest network equipotential bonding point shall be less than 5 Ω. The isolating component may be either a high-voltage capacitor or a double-wound transformer.

10.1.3 Non-isolated system outlet with protective element

Replace the existing text by the following new text:

This type of outlet does not incorporate any series isolation. Protection shall be provided by equipotential bondings as in 10.1.2. A protective element to improve safety (e.g. an RF coil) shall be connected between the inner and outer conductors of the coaxial connections. The DC resistance of this protective element shall be less than 1 Ω. The DC resistance between the

outer conductor of the coaxial connections and the nearest network equipotential point shall be less than 5 Ω.

10.1.4 Non-isolated system outlet without protective element

Replace the second sentence by the following note:

NOTE When this type of system outlet is used for back-powering, provision shall be made to prevent the power reaching other outlets.

10.2 Transfer point

Replace the first sentence by the following new text:

This device can also provide varying degrees of protection against electric shock (hazardous body currents), depending on the elements incorporated.

11 Protection against atmospheric overvoltages and elimination of potential differences

Add, after the first paragraph, the following new text:

All parts of the antenna system shall be so designed that they will withstand a lightning discharge without danger of fire or separation of the antenna system or parts thereof from the supporting structure.

Page 33

11.2.1 Earthing and bonding mechanisms

Replace the existing text by the following new text:

The mast shall be connected to earth via an earthing conductor. The outer conductors of all coaxial cables coming from the antenna shall be connected to the mast or to the earthing conductor via an equipotential bonding conductor having a minimum cross-section of 4 mm^2 Cu (see figure 8). The formation of loops shall be avoided. The earthing conductor shall be installed straight and vertical such that it can provide the shortest, most direct path to the earth-termination system.

Page 35

11.3 Overvoltage protection

Replace the last sentence by the following new text:

Examples are shown in figures 14 and 15.

Page 37

12 Mechanical stability

12.2 Bending moment

Replace the third sentence by the following new text:

The fixed part of the mast should be at least one-sixth of the full length.

Page 39

13 Laser radiation

Delete the title and text of this clause

Page 41

Figures

Replace figure 8, on page 55, by the following new figure 8:

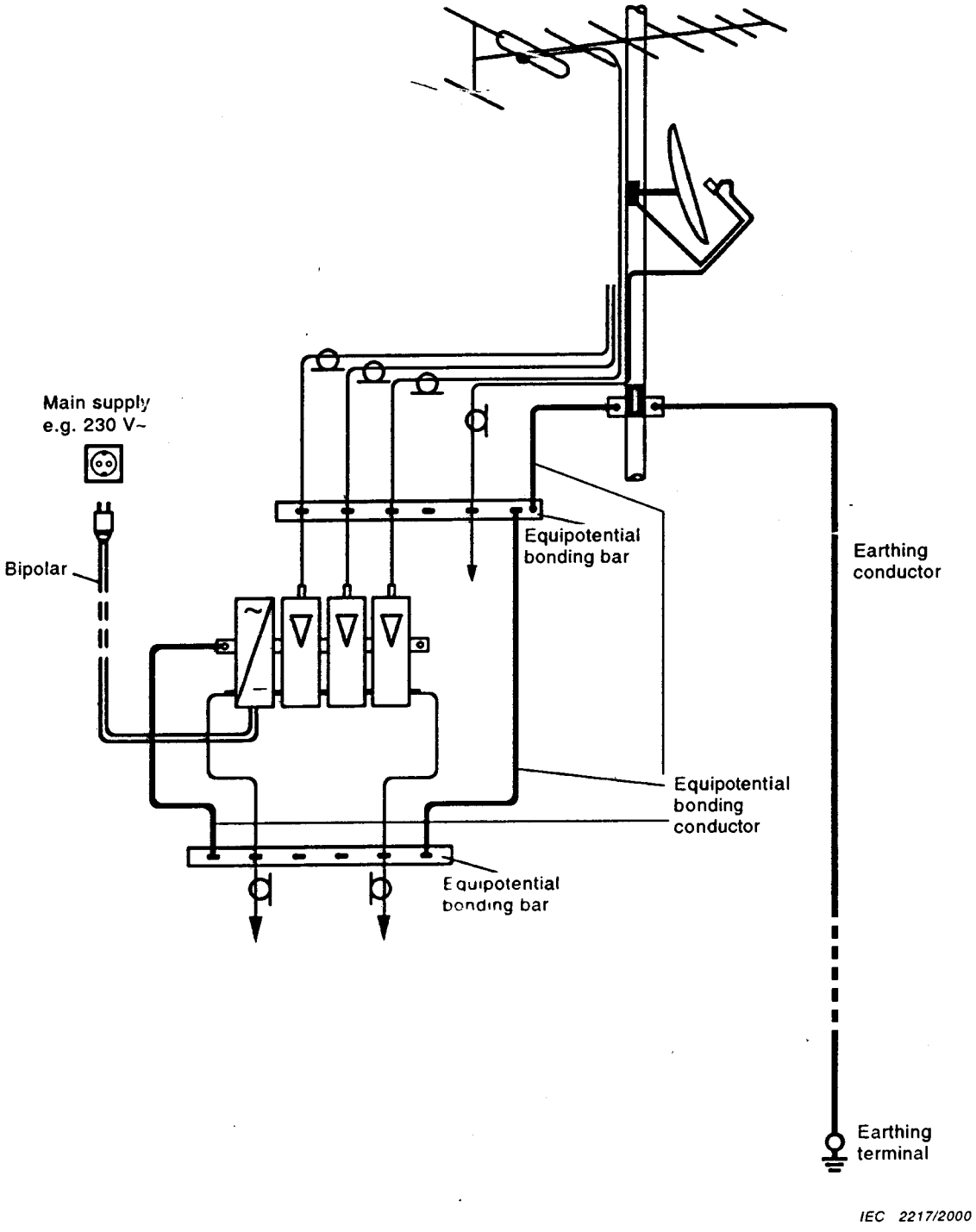


Figure 8 – Example of equipotential bonding and earthing antennas and head-ends

Page 65

Add the following new figures 14 and 15:

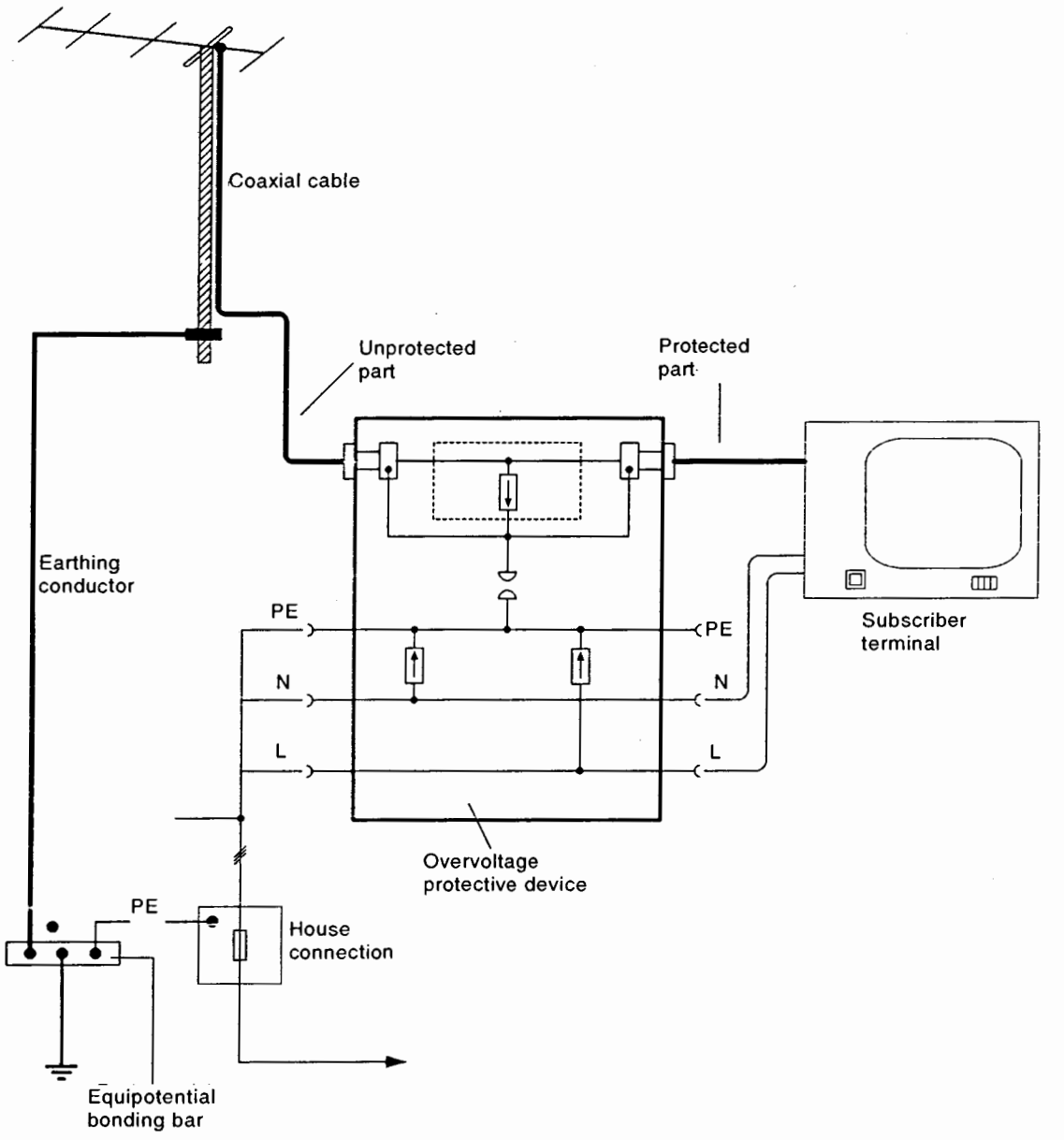
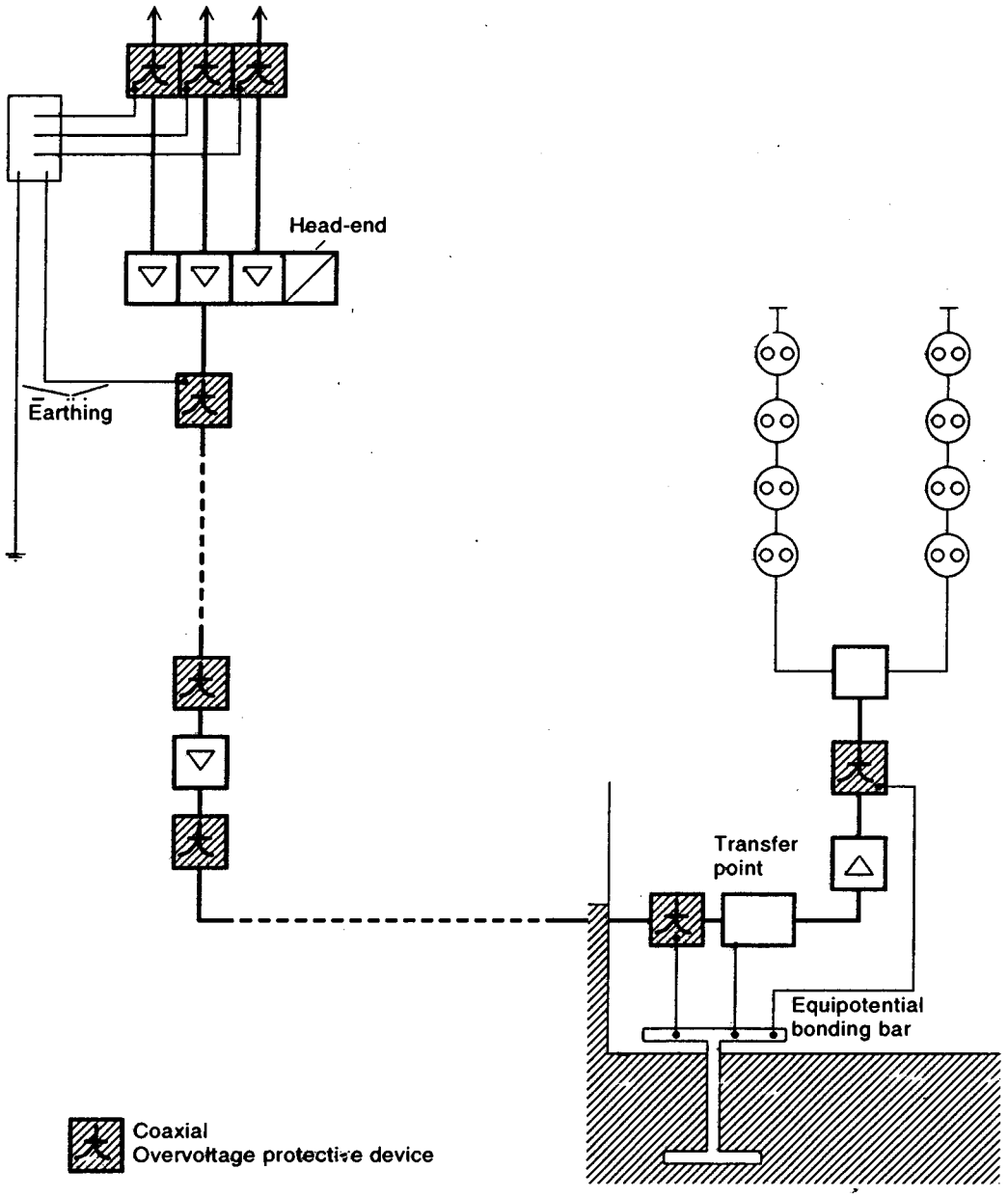


Figure 14 – Example of an overvoltage protective device



IEC 2219/2000

Figure 15 – Example of application of a coaxial overvoltage protective device

Add the following new annexes:

Annex A
(informative)

Symbols

Under consideration.

Annex B
(informative)

Abbreviations

a.c., AC	alternating current
CATV	Community Antenna Television (system)
d.c., DC	direct current
LPS	lightning protection system
MATV	Master Antenna Television (system)
r.f., RF	radio frequency
r.m.s., RMS	root mean square
SMATV	Satellite Master Antenna Television (system)
TV	television

NOTE The abbreviations with lower-case letters belong to IEC 60728-11:1997; in all new parts of IEC 60728 as well as in all amendments to former parts of IEC 60728, abbreviations have been changed to capital letters in accordance with practical use.

Add, after the new annexes, the following bibliography:

Bibliography

IEC 60479-1:1994, *Effects of current on human beings and livestock – Part 1: General aspects*
